REMARKS

All claims (1-28) were rejected under 35 U.S.C. §101 for failing to support "the claimed invention . . . by either a specific and substantial asserted utility or a well established utility." (Office Action, ¶¶5-7.) Applicants respectfully traverse. As the present claims recite a computer-related invention, guidelines for this analysis are found at MPEP §2106. The present claims do not fall under any of the three types of non-statutory subject matter discussed under MPEP 2106(B)(1): functional descriptive material (the present claims do define structural and functional interrelationships between data structures, signals, and other claimed aspects of the invention which permit the functionality of the system to be realized), nonfunctional descriptive material (the claims can "exhibit [a] functional interrelationship with the way in which computing processes are performed"), or natural phenomena (the systems and methods claimed do not appear in nature). To the contrary, the claims define statutory subject matter described in MPEP §2106(B)(2): product (system) claims 1-8 and 27-28 recite machines, each being "a concrete thing, consisting of parts or of certain devices and combinations of devices" that are well understood in the computer science art (see MPEP §2016(B)(2)(a)); and claims 9-26 represent statutory process claims that manipulate data representing physical objects or activities (MPEP §2106(B)(2)(b)(i); claims recite simulation of physical subsystems).

At the slightly more abstract level, the Office Action asserted that each independent claim "has no defined output, and therefore it does not have an output with a specific and substantial asserted utility or a well established utility. None of the dependent claims . . . rectify this defect." Applicants respectfully disagree on at least two grounds. First, distributed simulation systems, in general, are well known and have utility that is well understood and appreciated in the art. For example, a set of initial conditions is typically assumed, the model is executed, and

the value(s) of one or more state variables are examined either at a particular, later point in simulation time, or as they change over a period of simulation time. As discussed in the application, "Simulation of complex systems (those of a tank or aircraft, for example) in a reasonable time is extremely difficult, if not impossible, using widely available computing systems." (Paragraph [0003].) At least some systems embodying the claims also meet the need described in paragraph [0004]: "where multiple vendors are responsible for the various subsystems of a larger system, security and proprietary concerns may inhibit or prevent formation of cooperative simulation systems comprising simulation models of each subsystem provided by each vendor." The utility of simulation more generally is also spelled out by specific examples in several of the references cited by the Examiner in art rejections. Further, each claim recites some form of output signal that relates to at least one state variable. Applicants respectfully submit that the rejection under 35 U.S.C. §101 has been overcome, and request that it be withdrawn.

The Office Action also stated a rejection under 35 U.S.C. §112, first paragraph, suggesting that, because "the claimed invention is not supported by either a specific or substantial asserted utility or a well established utility . . . , one skilled in the art clearly would not know how to use the claimed invention." To the contrary, there are well established uses for continuous-time simulation technology that save money and risk. Some of these are mentioned in the application paragraphs cited herein, while others might be found in the article, "Distributed Simulation" from Aerospace Engineering (November 2004), submitted herewith. Connecting subsystem simulations as claimed provides advantages in security, and even speed, that are unheard of in the prior art. Applicants note that this enclosed article was written by

representatives of Northrop Grumman Corporation, reflecting the marketplace success of Applicants' embodiment of the claimed invention.

Paragraph 10 of the Office Action rejected claims 12-18 under 35 U.S.C. §112, second paragraph, for limiting the permissible values of a variable ("*n*") in the claim, then further limiting the values of *n* in dependent claims. Applicants respectfully traverse. Recitations in dependent claims that restrict a parent claim's recited range of a temperature, count, measurement, or other variable is well established and legitimate in U.S. patent practice. The dependent claims rejected in paragraph 10 of the Office Action follow that "further narrowing" practice, as distinguished from the principle ascribed in the Office Action to the BPAI in *Ex parte Wu* – that "where broad language is followed by 'such as' and then narrow language" a claim may be rendered indefinite. The situation in *Wu*, however, is not the situation here. The "narrower range" recited in claims 12 and 13 are not stated as alternatives or examples with a broader range being recited in the same claim. Instead, as mentioned just above, claims 12 and 13 further limit their respective parent claims in clear terms. Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

The Office Action rejected claims 9 and 12-19 over the Fujimoto reference. (See Office Action ¶¶15 *et seq.*) Applicants note that the Fujimoto reference (like all other references cited in the Office Action) describes an event-based, discrete-time simulation. In contrast, embodiments disclosed in the present application are (at least in part) continuous-time simulations that use numerical solvers of ordinary differential equations (such as implementations of the Euler and Runge-Kutta methods) to simulate the values of state variables over time. Claim 9 has been amended to recite that the first "simulating ..." step is done with a continuous-time simulation, which is believed to overcome this rejection.

The application of the present system to continuous-time simulations provides the unexpected advantage of greater-than-linear speed increases in many simulations relative to single-computer implementations. In the art, a linear speed increase in the number of computing units (O(n)) was a theoretical maximum for discrete-event simulations. (See Fujimoto, page 122: "By subdividing a large simulation computation into many sub-computations that can execute concurrently one can reduce the execution time by up to a factor equal to the number of processors that are used." (Emphasis added.)) In continuous-time simulations, computation time can be reduced by up to O(n^3). (Compare "Distributed Simulation" in Aerospace Engineering, November 2004, pages 25-27, especially Table 2 on page 27, and the caption of Figure 3: "For the HALE UAV power system, a nearly 21-fold increase in simulation speed was achieved by distributing the system simulation across three computers while producing results virtually identical to a single-computer implementation".) No cited reference discloses the claimed combination of steps recited in claim 9 as amended (nor in the claims depending therefrom, including claims 12-19), so Applicants request reconsideration of those claims as amended, and consequent withdrawal of the rejection. Furthermore, Applicants note that the unexpected results just described weigh against any finding of obviousness of these claims as well.

The Office Action also rejected claims 1-8, 10-11, 20-21, and 25-28 under 35 U.S.C. §103(a) over the combination of Fujimoto with the DMSO Facility reference and the DMSO HLA page. Claim 1 has been amended to recite that the "first executing process ... implements a first continuous-time model to simulate a first subsystem," which is neither shown nor suggested in the cited references. Further, claims 2-8 depend from claim 1, and claims 10-11, 20, and 25-26 depend from claim 9 (discussed in the paragraphs above, claim 21 having been cancelled), so the rejection of those claims has also been overcome.

Likewise, claim 27 has been amended to recite that the first process executes instructions to "implement a first continuous-time simulation model solved with a numerical solver," among other things. Again, the cited art neither shows nor suggests use of instructions to implement the recited functions to simulate any continuous-time models, and Applicants respectfully request reconsideration of claim 27 (and claim 28, which depends from it).

The Office Action stated a rejection of claims 22-24 under 35 U.S.C. §103(a) over the above combination in further view of certain matters taken on Official Notice. Claims 22 and 23 have been cancelled by amendment herein. Claim 24 depends from claims 9 and 20, discussed above, and (as amended) further recites graphing of "the first state variable versus an independent variable." In addition to the distinctions over the cited art in those parent claims, this graphing of a variable that is part of the requested export (see claim 9) is also neither shown nor suggested in the cited art. Applicants respectfully request reconsideration of claim 24 as amended.

New claims 29-33 and 34-35 refine aspects of claim 1 and 9, respectively, while new claims 37-38 refine the graphing that is recited in claim 24. New independent claims 39 and 40 recite the ODE-based and better-than-linear speed increase of the disclosed system. Claims 41-42 recite refinements of the speed-up recited in claim 40.

CONCLUSION

For the foregoing reasons, Applicants submit that all claims are in a condition for allowance, and respectfully request a prompt Notice of Allowance for all pending claims. It should be understood that the above remarks are not intended to provide an exhaustive basis for patentability or concede the basis for the rejections and/or objections in the Office Action.

The original application included 3 independent and 28 total claims, and after the amendments above the application has 5 independent and 37 total claims. A credit card charge authorization form is included in amount including $425.00 in new excess claim fees. The Commissioner is also authorized to charge the two-month request for extension fee in the amount of $225 to the credit card detailed on the attached form PTO-2038. No additional fees are believed to be required with this Amendment; nevertheless, the Commissioner is hereby authorized to charge any fees due, including statutory fees for extensions of time, to Deposit Account No. 23-3030, but not to include any payment of issue fees.

Reconsideration of the present application, as amended, is respectfully requested. If there are any remaining issues that can be addressed telephonically, the Examiner is invited to contact the undersigned to discuss the same.

Respectfully submitted,

By: _____

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